University of Dar es Salaam Library Journal
Vol 18, No 2 (2023), pp 19-35
ISSN: 0856-1818

Artificial Intelligence Services at Academic Libraries in Tanzania: Awareness, Adoption and Prospects

Hussein Bakiri
Department of Computer Science, Faculty of Computing and Mathematics
Institute of Finance Management
Email: hussein.bakiri@ifm.ac.tz

Hadija Mbembati
Department of Electronics and Telecommunication Engineering
College of Information and Communication Technologies, University of Dar es Salaam
Email: hadija@udsm.ac.tz

Rose Tinabo
Department of Information Technology, Faculty of Computing and Mathematics
Institute of Finance Management
Email: rose.tinabo@ifm.ac.tz

Abstract

Libraries use various information management systems for organizing, packaging, and repackaging services to mention a few. The reliability of these services is highly affected by several factors including; an increase in the number of users, limited resources, decentralized learning, and the emergence of digital resources. Bearing the benefits that AI technologies offer to libraries including cost-effective operations, improved services, and timely analyses, research to investigate the awareness and prospects have been conducted in various countries. Several studies investigated the level of adopting AI technologies for effective services in academic libraries for a particular study area. The general observation from such studies indicates that the level of AI adoption and awareness varies depending on a particular country under investigation. Therefore, due to the diversification of awareness and adoption levels from various areas, it is vital to investigate it in the Tanzanian context. This study aims to investigate the level of awareness and prospects of AI adoption in Tanzanian academic libraries using a qualitative approach in which 36 librarians from 7 giant and widespread higher learning institutions (HLI) are interviewed. The findings reported in this study indicate that the level of awareness is high (68.3%) while that of adoption is low (23%). Furthermore, the findings imply that the demand and readiness for the adoption of AI among librarians is very high. Therefore, this work provides new information to librarians, HLIs' management, and policymakers regarding the trend of artificial intelligence adoption in academic libraries. The findings reported in this paper can be used by librarians and management to align their plans toward AI adoption for effective and better service delivery.

Keywords: Library, information services, artificial intelligence, AI adoption
https://dx.doi.org/10.4314/udslj.v18i2.3

Introduction

Library Information Services (LIS) involves processes of acquiring, managing, and disseminating information to information seekers. It also involves mechanisms of organizing, packaging and repackaging information from diverse information containers in a way that can be easily accessed and retrieved by library users (Soltani & Nikou, 2020). On the other hand, academic libraries specifically play important roles in supporting teaching, learning, and research activities (Mathar *et al.,* 2021). However, due to the development of science and technology, libraries incorporated some digital means, including Artificial Intelligence (AI) technologies to supplement the traditional ways of service provision (Beile *et al.,* 2020).

Nowadays many academic libraries are doing their best to ensure that they include AI-enabled technologies for the sake of utilizing the benefits that the technology offers (Harisanty *et al.,* 2023). AI is a paradigm that attempts to develop a solution by mimicking human intelligence such as the power of reasoning and rational behaviours (Asemi *et al.,* 2020; Cox *et al.,* 2019). The paradigm includes technologies such as expert systems, Artificial Neural Networks (ANN), natural language processing, and pattern recognition. These technologies have brought a big revolution to both librarians and library users including, ad-hoc query processing, recommendation systems, cyber security, shelving, cataloguing, and improved service in general (Cox *et al.,* 2019). However, despite the aforementioned benefits offered, researchers advocate the adoption of AI technologies for libraries requires a big investment in funding, time, and staff (Ali *et al.,* 2022). Therefore, the necessity of adopting AI in academic libraries has become an area of interest in recent years.

Yusuf *et al.,* (2022) and (Saibakumo, 2021) investigated the level of adopting AI technologies for effective library services in academic libraries in Nigeria. Yoon *et al.*, (2022) researched to understand how AI technologies are currently being utilized in North America's public and academic libraries, and how librarians perceive the adoption of new technology. Ali *et al.*. (2021) explored the picture of AI effects in various Pakistan university library operations technical and user services. Huang (2022) researched to explore various AI applications used by academic libraries in Taiwan; investigating the key factors and impediments related to their implementation. The general finding reported from the surveyed literature is that the level of AI adoption and awareness is low in Nigeria but it is relatively fast-growing in other countries such as Pakistan and North America. Therefore, due to the diversification of awareness and adoption levels from various countries, it is vital to investigate Tanzania as well.

To the best of our knowledge, the research to investigate how Tanzania's libraries attempt to embrace the use of AI in their library services has not been studied. Therefore, the main objective of this research is to investigate awareness and prospects of AI adoption in Tanzania's academic libraries through several research questions as follows:

1. What is the level of awareness of AI-based library information system management (LISM) in Tanzania's HLI libraries?
2. To what extent have the academic libraries in Tanzania adopted AI-based LISM tools?
3. What are the prospects of adopting AI-based LISM in the future?
4. How do awareness, adoption, and prospects in Tanzania's HLI differ from other studies?

The research surveys some academic libraries from Higher Learning Institutions. The findings from this research are vital to library manager in Tanzania to measure their paces; "where they are" and "where they are supposed to be" lest they are left behind with the technology. Furthermore, the findings will facilitate the librarians to twist their plans toward AI adoption.

University of Dar es Salaam Library Journal
Vol 18, No 2 (2023), pp 19-35
ISSN: 0856-1818

Literature Review

Academic libraries

Academic libraries provide extensive informational services to support the learning process and provide support for research activities. These libraries are generally attached to the Higher Learning Institutions (HLI) with the target of providing research materials and supporting the curriculum (Megan Oakleaf, 2010). Furthermore, academic libraries are essential for the betterment of all educational stakeholders such as learners, teachers, and educational authorities (Mathar et al., 2021).

Emerging technology such as Information Technology (IT) resulted in many academic libraries using digital libraries and modern social media applications for library services (Hussain, 2023). A digital library facilitates the accessibility of library information services, digital materials, and resources online. These libraries provide a digital platform for educational stakeholders to easily access a wide range of information through text, video, audio, and other digital resources. The digital library has become more popular in academic libraries due to its advantage over the traditional physical libraries that are based on paper and other related materials (Rahaman *et al.,* 2022).

Recently, some libraries have leveraged the use of advanced technologies such as artificial intelligence (AI), machine learning, and big data analytics to enhance library information services (Cox *et al.,* 2019). These emerging technologies result in the deployment of intelligent libraries to enhance and transform library services and systems. Intelligent libraries use advanced technology such as recommender systems, intelligent search, and chatbots to enhance the user experience and improve library operations (Bi *et al.,* 2022). The advantages of intelligent libraries are information security, high speed, and reduced cost of services (Asemi *et al.,* 2020).

Artificial Intelligence Adoption in Academic Libraries

The adoption of AI into academic libraries is driven by the desire to change from traditional libraries to intelligent libraries. As artificial intelligence technology continues to advance, many researchers have their views that AI could positively transform library services. Lund and Wang (2023) opined that the proper use of AI technology specifically chatGPT enhances library services such as search and discovery, reference, information services, catalogue, and content creation while maintaining ethical considerations such as privacy and bias. In another study, it was noted that AI automates and simplifies some operations in academic libraries that may result in librarian job loss; however, some librarians believe that the
intelligence provides many tools to enhance the functionality of academic libraries technology allows them to focus on more complicated and high-value jobs (Adetayo, 2023).

AI toolsiniclude natural language processing (NLP), chatbots, robotics, and big data to mention a few. These tools assist academic libraries in data management and digital preservation, increase accuracy in search results, provide instant help to users, and automate librarian's daily activities (Ali *et al.,* 2020). Studies indicate that most of the libraries in developed countries use AI tools, but this is not the case in most developing countries (Abayomi

et al., 2021). The limitation includes lack of awareness, countries' technological infrastructure limitations, data availability and quality, cost constraints and resource limitations, ethical considerations, and cultural factors, as well as the lack of a skilled workforce and capacity-building needs (Barsha & Munshi, 2023)

Studies observed that some of the academic libraries in developing countries deployed fewer AI tools such as machine learning for chatbots and virtual Assistants (Hussain, 2023). Through this AI tool, librarians can answer common questions instantly from library users (Mardiana *et al.,* 2019). Several researchers, like Hamad *et al.,* (2023) investigated the level of adopting AI technologies to enhance library services in developing countries. AI technologies are growing very fast and are slowly being adopted in libraries (Ali *et al.,* 2022), this calls for more research on the adoption and implementation of new AI tools into academic libraries to build intelligent libraries (Yoon *et al.,* 2022).

Related Works

Recently, the adoption of AI in academic libraries has been an interesting research area in the field of information technology and libraries. Several related works have explored various integration issues such as awareness, challenges, and perspectives. For example, Ali *et al.,* (2020) examined the awareness of AI tools in Pakistan academic libraries and noted that some tools such as NLP and pattern recognition methods are frequently used to simply accessibility of library information services. The study also recognizes that the level of awareness regarding other AI tools such as chatbots and robotics is very low in Pakistan academic libraries. Many academic libraries in Taiwan plan to implement chatbots and guide robotics shortly (Huang, 2022). It has been reported that many robots or chatbots are implemented in China, Australia, and America, where research funding and technology are more easily available (Harisanty *et al.,* 2023).

The level of AI awareness in public and academic libraries is almost the same, though public libraries are more aware of robots while academic libraries are almost aware of big data (Yoon *et al.,* 2022). The study conducted in Nigeria reported that the librarian's level of awareness of AI technologies is very high approximately 76.4% (Saibakumo, 2021). Though the awareness level is high, the adoption of AI tools in libraries is still found to be extremely low (Yusuf *et al.,* 2022). To increase the adoption level, researchers, like Okunlaya *et al.,* (2022) developed an artificial intelligence library services conceptual framework to motivate the implementation of AI tools into academic libraries.

The perception of AI adoption varies between individuals and groups. For example, Lund *et al.,* (2020) surveyed academic librarian's AI perception and the result shows that librarians have a positive perception of AI adoption in library operations and are ready to implement fewer AI tools. From the findings discussed in the review article by Harisanty *et al.,* (2023), it can be concluded that the AI awareness and adoption level in libraries is still not optimal and varies depending on a particular country under investigation. Therefore, due to the diversification of awareness and adoption levels from various areas, it is vital to investigate it in the Tanzanian context. This study aims to investigate the level of awareness and prospects of AI adoption in Tanzanian academic libraries.

University of Dar es Salaam Library Journal
Vol 18, No 2 (2023), pp 19-35
ISSN: 0856-1818

Research Methodology

Initially, the study targeted to reach 10 Tanzania's higher learning institutions (HLI), namely; Tanzania Institute of Accountancy (TIA), University of Dar es Salaam (UDSM), Dar es Salaam University College of Education (DUCE), Institute of Finance Management (IFM), Institute of Rural Development Planning (IRDP), College of Business Education (CBE), Muhimbili University of Health and Allied Science (MUHAS), Saint Augustine University of Tanzania (SAUT), Mzumbe University, and Tanzania Public Service College (TPSC). Consideration of these higher learning institutions was motivated by not only their giantism but also the number of campuses across the country. Furthermore, the selected institutions are not only members of the Consortium of Tanzania Universities and Research Libraries (COTUL) but also registered by the Tanzania Commission for Universities (TCU). However, ultimately 7 HLI were reached because of the limited accessibility of 3 universities (IRDP, TPSC, and SAUT).

This research was set to investigate the awareness, adoption, and prospects of AI services in Tanzania's academic libraries. The assessment process was achieved using qualitative methodology. It is qualitative because the research intends to capture descriptive information and opinions from the participants. Furthermore, qualitative analysis was applied to draw insights from the information. The research design framework shown in Figure 1 conveys the overall processes undertaken in this work.

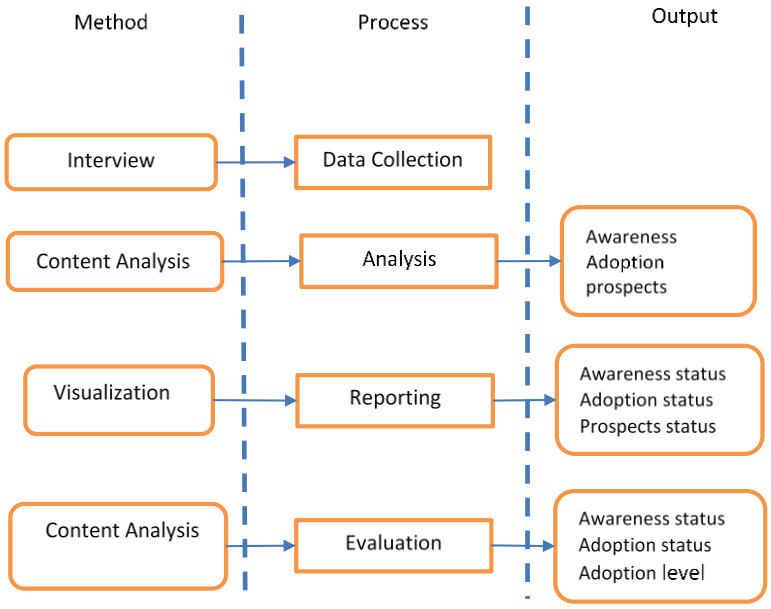

Figure 1: Steps taken during research design

Participant Characteristics

The participants of this research were grouped into three categories; library users, directors, and staff. These groups were considered because the interview questions attempted to probe the

questions that required responses from the decision-makers, users, and the staff in general. The participants were considered to be graduates from higher learning institutions and have backgrounds in ICT. Furthermore, the research considered the participants from seven well-known higher learning institutions from the Tanzania mainland.
The participants were categorized into 3 groups; namely library users, staff, and directors. The category of "users" was considered to grasp insights based on the client's demand and motives. Regarding the staff's category, the intention was to grasp the insight based on their perspectives. Lastly, the director's category helped us dig into the matters of decision-making and planning. Thus, one director, five users, and five staff from each sample were interviewed. This makes up a total of about 36 participants.

Study Population and Sampling

A total of seven academic libraries were considered. The selection of these libraries was based on a purposive sampling technique. This technique is one of the non-probability sampling methods in which the selection of a sample is based on the purpose at hand. The purposive sampling technique followed the steps illustrated in Figure 2. From the figure, more than 140 libraries were identified from the population. These libraries were owned by the tertiary training institutions in Tanzania. After further purposive analysis, a sample of 70 libraries was found. These libraries were owned by the institutions which were recognized by the TCU.

Further purposive analysis based on libraries whose HLI are members of COTUL yielded 52 samples. The final analysis was then conducted based on the libraries whose HLI institutions have more than one campus located all over the country. In this final stage, a total number of 10 sample libraries were found.

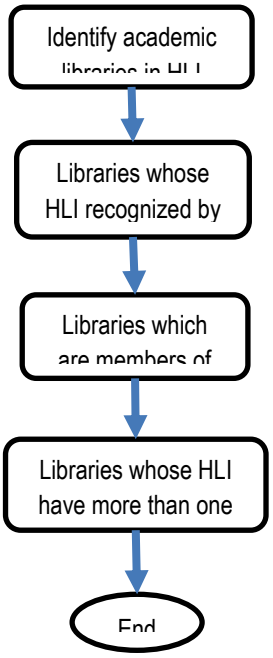

Figure 2: Steps taken during the setting of purposive sampling

Data Collection

This study used the interview method to collect information from the participants. This method was used because we wanted to ensure a flexible and guided environment for participants. In addition to the choice of the method, the research intended to probe in-depth information from the participants. Also, the type of interview preferred in this study was the structured interview. This type of interview was chosen because we wanted to ensure that the research attains a high level of reliability and validity. In addition to reliability and validity, another consideration for choosing the type of interview is the less time it takes for the interviewing and analysis processes. Data was collected for 10 days; between 11th September to 21st September 2023, excluding weekends. Concerning the data, the language used to prepare and distribute the questionnaires was English. The reason for using English is that the participants are graduates and aware of the use of English as the language of communication. The participants were either the heads , librarians or directors of libraries. The interviews were guided in the form of prepared questions in a hard copy.

Designing the Interview Instrument

One person was nominated as the interviewer. This person was a university graduate and works as an assistant librarian at the Institute of Finance Management. The interviewer was trained about the ethical issues of the interviewing process. Also, the interviewer was trained on the concept of artificial intelligence services for library management. To ensure that the study receives valid responses, the interview questions were designed to be simple, flexible, and unambiguous.

The interview questions were categorized into five parts; part A, part B, part C, part D, and part E. Part A consisted of demographic questions. The questions intended to explore participant's characteristics such as age group, gender, and so on. This characteristic information is essential because it was used to make inferential analysis in the interpretation process. Furthermore, the part A consisted of 5 closed-ended questions. The questions in the rest of the parts were formulated as a mixture of closed- and open-ended forms. Part B, part C, part D, and Part E, intended to collect information regarding awareness, adoption, prospects, and the need for AI technologies in libraries respectively. The detailed appearance of the questionnaire is attached in the appendix.

Validity and Reliability

To ensure validity, the questionnaire was reviewed among a group of experts in research design from various faculties. Furthermore, to ensure validity, experienced librarians were also involved in designing the contents of the questionnaire. Moreover, other related fields, such as measurement, evaluation, linguists, and information technology checked the questionnaire to ensure its suitability for the questions under the probing. In addition, the questionnaire was revised according to the recommendations from the reviewers.

Data Analysis

The responses were organized using a spreadsheet program; namely Microsoft Excel. The content analysis method was then used to analyze the data. The method offers powerful features for analyzing both qualitative and quantitative data compared to the thematic analysis method. The R programming language tool (RStudio version 2023.06.1, build 524) was used to implement the content analysis method. The "quanteda" package in R programming was used for this purpose. Furthermore, the findings of the analysis process were interpreted based on visual plots and tables.

Findings

Respondents Characteristics

The analysis shows that most of the participants who responded to our interview were between the ages of 31 and 40. Followed by those whose age interval is between 41 and 60. On the other hand, fewer participants who dedicated their time to answering the interview questions were aged above 61. These observations indicate that the findings of this work reflect the characteristics of participants who are in the age interval of 31 to 40. The findings are communicated in Figure 3.

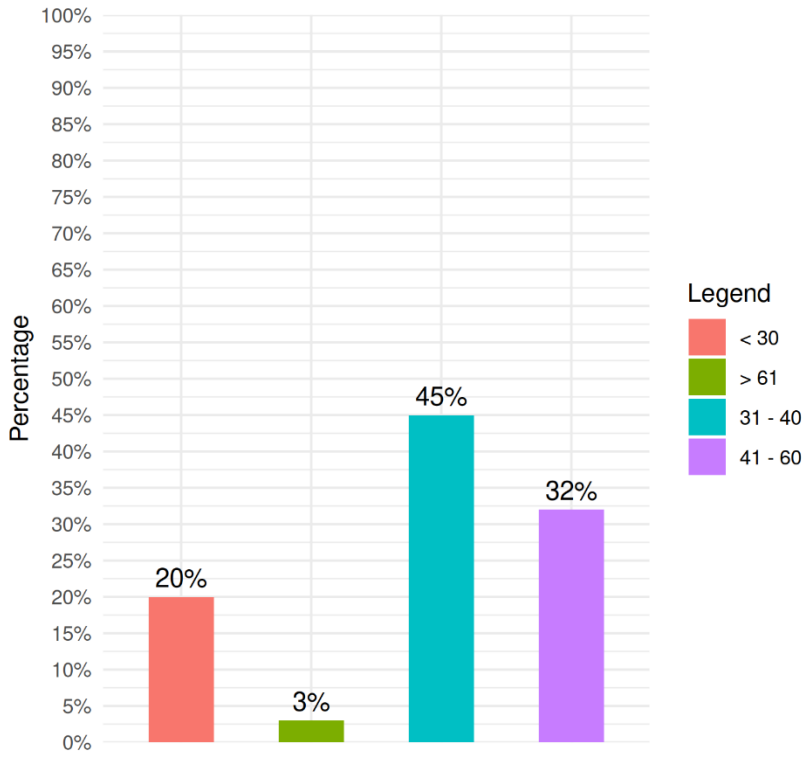

Figure 3: Percentage frequency based on the age group of the respondents

University of Dar es Salaam Library Journal
Vol 18, No 2 (2023), pp 19-35
ISSN: 0856-1818

Findings from the analysis show that most of the participants who engaged in the interview have a background in IT-related fields. Knowing the participants' awareness of IT will lead us to make suitable inferences in connecting it to artificial intelligence. This is because many scholars suggest that the adoption of artificial intelligence tools is motivated by having a background in IT-related fields. Figure 4 shows the percentage of participants who have a background in IT related to those who don't have it.

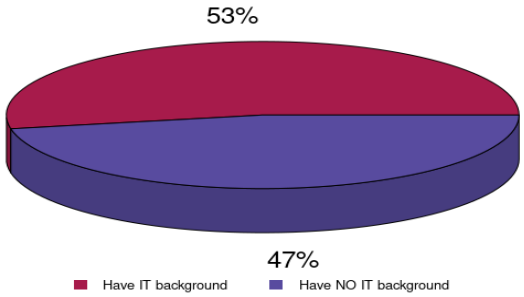

Figure 4: IT vs Non-IT respondents

The last characteristic of the participants presented in this findings section is concerned with the work experience of the respondents. Figure 5 represents the characteristics of the participants concerning work experience. The figure indicates that many librarians who participated in the interview had worked for libraries for more than 10 years. Moreover, another large group of participants who engaged with the library had an experience of less than 5 years. Therefore, it implies that the finding reported in this study is largely concerned with librarians who had worked from 5 to more than 10 years.

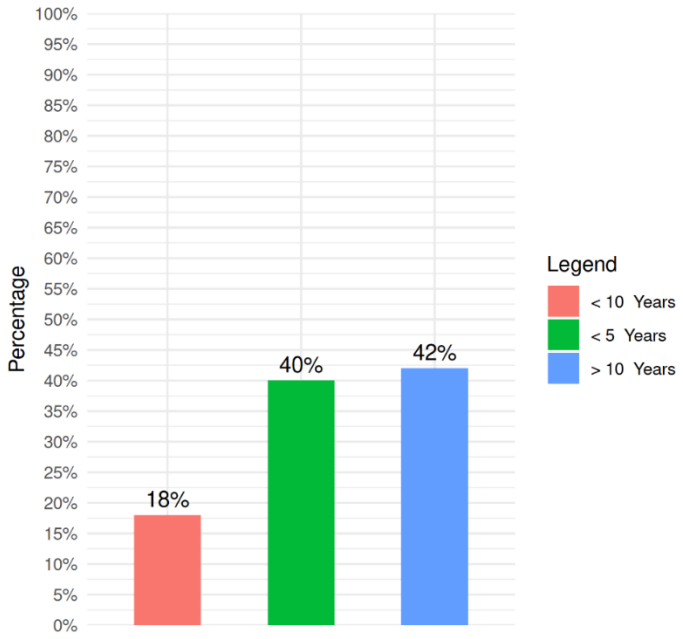

Figure 5: Work experience of the participants

Awareness of AI-enabled LISM Tools

The findings indicate that most of the participants are aware of AI tools used for the automation of library information services. The study assessed the awareness component by considering familiarity, known tools, and perceived benefits as shown in Figure 6. Among the interviewed librarians, 71% responded that they know some of the AI tools used in libraries. Furthermore, the participants who said that they understood the benefits that are offered by AI technologies to libraries were 68%. Lastly, 66% of the participants interviewed said that they are familiar with AI technology. Therefore, based on the findings, it can be deduced that the level of awareness of librarian staff in academic libraries in Tanzania is about 68.3%.

Regarding the assessment of the awareness level, first; 29% said that "we don't know any AI tool used in libraries". Second, 34% of the participants were observed to be completely unfamiliar with AI technologies in general. Third, 32% of the participants were not able to state the perceived benefits of AI technologies as far as the library is concerned. Note that the "na" in figure 6 and throughout the paper implies that the participants did not respond to such a question.

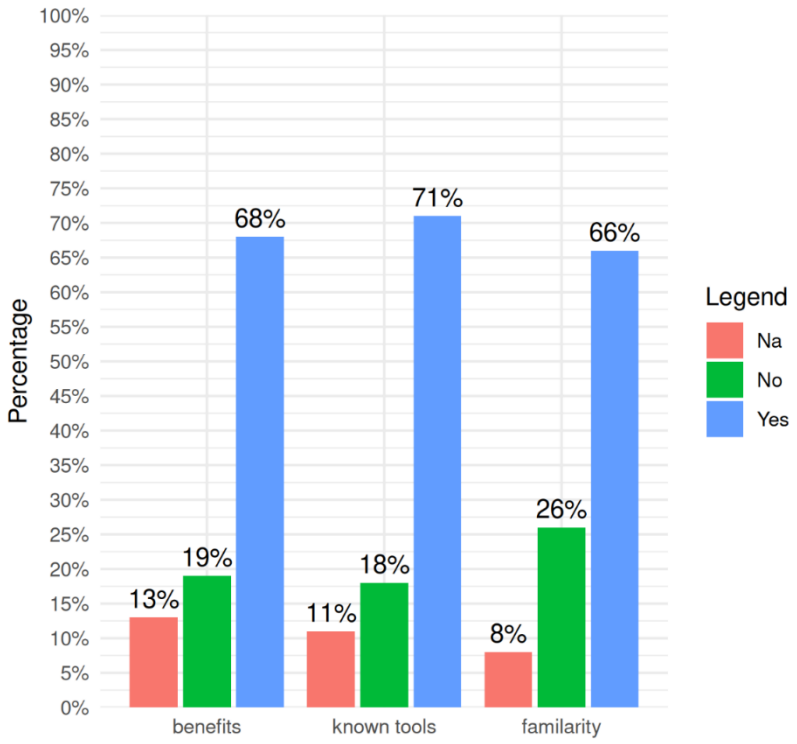

Figure 6: Awareness of AI technologies in academic libraries

The level of AI Adoption in Academic Libraries

The interview questions in part C were set to probe some information concerning the adoption of AI services in academic libraries. The first part of the interview question was asking whether the library has adopted any of the AI services. The second part of the question wanted the respondent to specify the particular purpose/function of the AI tool adopted in his library. The findings from the content analysis show that 23% of the respondents said that their libraries adopted some AI-based services while 61% said that "it is not adopted". Furthermore, 16% of the respondents said; "We don't know anything about AI technology". The findings regarding AI adoption are communicated in Figure 7.

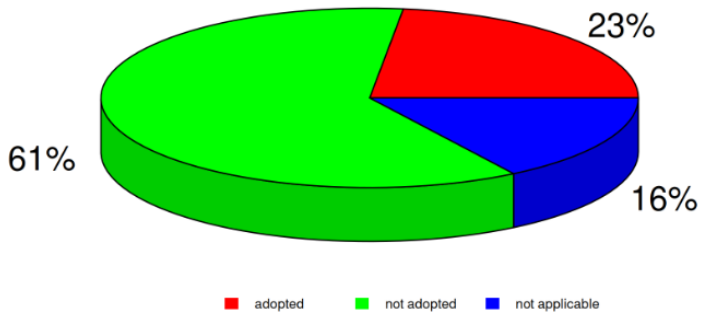

Figure 7: The extent of AI adoption in libraries

Regarding the category/purpose/use of the adopted AI, "barcoding" was mostly rated among the librarians at 18%. This finding shows that many libraries have at least adopted AI services to automate the barcoding process. The barcoding service is followed by classification and cataloguing services at 15% and 14% respectively. Furthermore, the findings indicate that the AI tools for RFID service have been adopted the least by only 1% as shown in Figure 8.

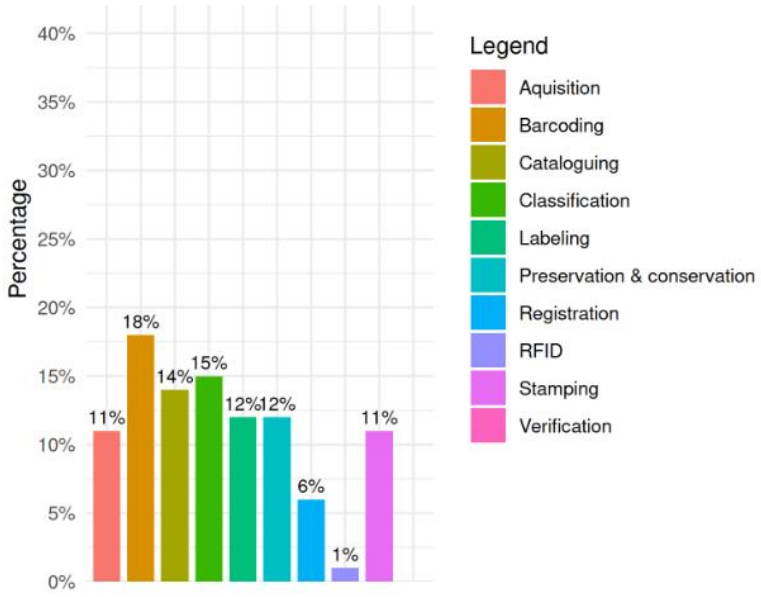

Figure 8: Adopted AI services based on the purpose/use

Prospects of AI Adoption in Academic Libraries

Part D of the interview questions intended to probe the future expectations towards the adoption of AI tools in libraries. This is purposefully for those libraries which have not yet adopted any of the AI services but they are aware of the benefits that the technology offers. The part asks whether the library has any plans to adopt AI technology in the future. Also, it asks whether there are any initiatives towards the adoption process. The part continues further to probe for the level by asking the respondent to specify the planning and initiative stage the library has

University of Dar es Salaam Library Journal
Vol 18, No 2 (2023), pp 19-35
ISSN: 0856-1818

achieved. Finally, the part requires the respondent to mention the reasons why the library has not yet planned and initiated the adoption process.

The analysis of those who have not yet adopted AI services in their libraries shows that 39% said that they have plans to adopt AI technologies. Moreover, 61% of the participants indicated that their libraries have no plans for adopting AI technologies. Furthermore, among the libraries that plan to adopt the AI technology, 26% stated that their libraries have initiated the adoption process while 74% have not. The grouped-barchart in Figure 9 shows the findings concerning the prospects of AI adoption in academic libraries.

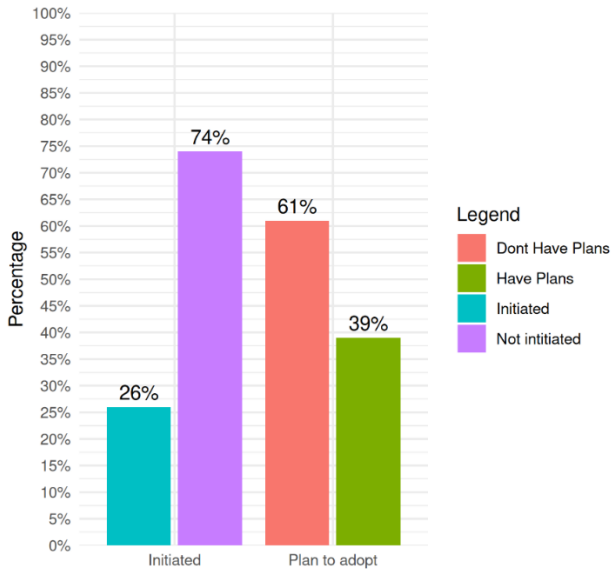

Figure 9: Libraries that have plans for adopting AI vs. those who don't have plans

The Need for AI for Library's Service Automation

Part E of the interview questions intended to probe about the need for AI among the librarians. This part is purposefully for all librarians. The part probes into the particular benefits that the library will get upon adopting the AI technology. Also, it asks about which library service a librarian is prioritizing and recommending for being automated using AI technology.

The findings from the analysis show that 29% recommended having AI technology for automating information services especially in check-in/out operations. Furthermore, 13% and 12% recommended having AI for searching and current awareness services. The participants showed the need for having almost all services among the common AI services for the library. This shows that the average need for AI is relatively moderate about 45%. Figure 10 shows the average need for AI services by librarians based on particular services.

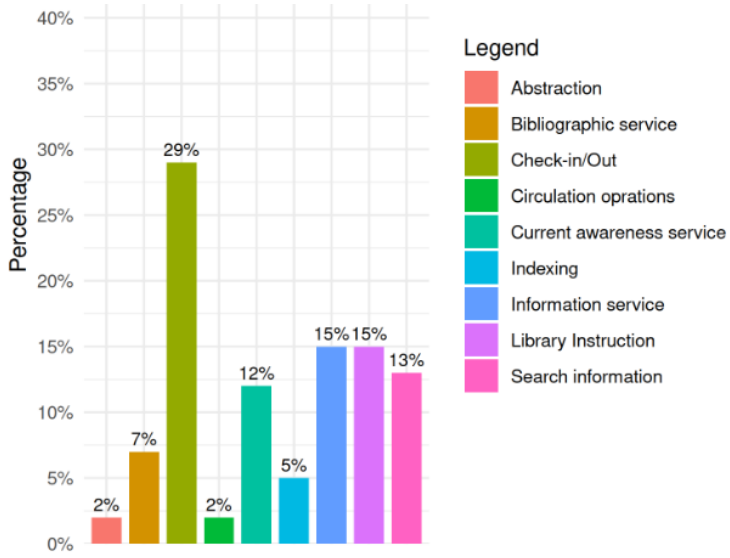

Figure 10: Some AI services prioritized by librarians

Discussion

First, the findings indicate that most of the librarians in Tanzania's higher learning institutions are aware of AI-based information services used in libraries. Regarding awareness, the findings indicate that the level is about 68.3%. This amount somewhat agrees with levels of awareness reported in various studies such as the one conducted in Nigeria where 76.6% is reported (Saibakumo, 2021). Having attained this level of awareness of AI among librarians implies that HLI will experience a gentle slope toward the pre-adoption processes such as planning and initiation.

Second, the findings in this study portray that some basic AI services have been adopted among academic libraries at a relatively low level. The level is found to be 23%. However, our findings agree with those found in (Harisanty *et al.*, 2023) where the level of adoption is reported to be low. In addition, our findings indicate that libraries have adopted AI technologies for some few basic services such as book cataloguing, classification, and registration. Other advanced AI-based services for libraries such as robotics and chatbots have not yet been adopted. The latter confines with the fact reported in (Huang, 2022).

Third, the findings imply that there is a prospect that many libraries in HLI will adopt AI services in the future. This follows the analysis of those libraries that did not adopt the AI services. The prospect was indicated by the moderate level (39%) of libraries that have plans on adopting AI services. Furthermore, the low level (26%) of those who have started some initiatives towards AI adoption implies that they face some challenges. Most of the librarians stated that AI technologies are expensive, and require highly skilled IT personnel, librarian's willingness, and poor management. The findings regarding the level of prospects and challenges toward AI adoption agree with those reported in (Barsha & Munshi, 2023).

Fourth, when the participants were probed regarding the need for AI services in their libraries, the findings imply that there is a high demand for such a technology. The high demand is accelerated by the perceived benefits that AI provides. These benefits were stated by many librarians. The level of demand for AI technology observed from librarians in this study

conforms with those identified by scholars in other works such as the ones reported by (Hussain, 2023).

As a common practice for research to come up with some limitations. Three limitations have been observed in this study. First, the research is limited to few surveyed HLI libraries. Therefore, the findings reported in this study cannot fully generalize the situation of Tanzania's libraries as far as AI adoption is concerned. However, the findings give insight and highlight the common practice such that the whole trend of AI adoption can be anticipated. Second, the research is limited to librarian staff and only one director. Furthermore, the focus was to reach library users, directors, and staff; besides, we ended up having more staff members without library users participation. This was because it was difficult and bureaucratic to reach the directors. On top of that, we could not get library users' participation because the data collection process was undertaken during the off-season period were students were on holiday. Therefore, a large part of the reported findings contain responses from the librarian staff including the heads of units.

Conclusion

The study has assessed the awareness level among the librarian users in Tanzania's academic libraries as far as artificial intelligence technology is concerned. It also investigated the level of adoption as well as the prospects using a qualitative approach in which 36 librarians from higher learning institutions were interviewed. In addition, the study highlighted some of the challenges that academic libraries face with the adoption of the technology. The findings reported in this study indicate that the level of awareness is high by 68.3% while that of adoption is low by 23%. Furthermore, the findings imply that the demand and readiness for the adoption of AI among librarians is high.

The contribution of this work is threefold; first, it provides new information to librarians, HLIs' management, and policymakers regarding the trend of artificial intelligence adoption in academic libraries. To the best of our knowledge, this information is new because it has not been published before this work. Therefore, the findings reported in this paper can be used by librarians and management to align their plans toward AI adoption for effective and better service delivery. Second, this paper serves as a reference point for future research that will attempt to extend the context of this work. Third, the paper highlights some important issues that stumble librarians towards the adoption of AI services.

Based on the findings reported concerning the higher level of prospects among librarians, this paper recommends that the policymakers align their plans so that a high priority is given to the adoption of AI technologies in libraries. These plans should focus on providing more training, policy adjustments, and support. Also, future work can extend the scope of this study to include a large sample size covering all librarians; library users, library staff, and directors.

References

Abayomi, O. K., Adenekan, F. N., Abayomi, A. O., Ajayi, T. A., & Aderonke, A. O. (2021). Awareness and perception of the artificial Intelligence in the management of university libraries in Nigeria. *Journal of Interlibrary Loan, Document Delivery and Electronic*

Reserve, *29*(1–2), 13–28. https://doi.org/10.1080/1072303X.2021.1918602
Adetayo, A. J. (2023). Artificial intelligence chatbots in academic libraries: the rise of ChatGPT. *Library Hi Tech News*, *40*(3), 18–21. https://doi.org/10.1108/LHTN-01-2023-0007
Ali, M. Y., Naeem, S. Bin, & Bhatti, R. (2020). Artificial intelligence tools and perspectives of university librarians: An overview. *Business Information Review*, *37*(3), 116–124. https://doi.org/10.1177/0266382120952016
Ali, M. Y., Naeem, S. Bin, & Bhatti, R. (2021). Artificial intelligence (AI) in Pakistani university library services. *Library Hi Tech News*, *38*(8), 12–15. https://doi.org/10.1108/LHTN-10-2021-0065
Ali, M. Y., Naeem, S. Bin, Bhatti, R., & Richardson, J. (2022). Artificial intelligence application in university libraries of Pakistan: SWOT analysis and implications. *Global Knowledge, Memory and Communication*, 73(1), 219-234. https://doi.org/10.1108/GKMC-12-2021-0203
Asemi, A., Ko, A., & Nowkarizi, M. (2020). Intelligent libraries: A review on expert systems, artificial intelligence, and robot. *Library Hi Tech*, 39(2), 412–434. https://doi.org/10.1108/LHT-02-2020-0038
Barsha, S., & Munshi, S. A. (2023). Implementing artificial intelligence in library services: A review of current prospects and challenges of developing countries. *Library Hi Tech News*. https://doi.org/10.1108/LHTN-07-2023-0126
Beile, P., Choudhury, K., Mulvihill, R., & Wang, M. (2020). Aligning library assessment with institutional priorities: A study of student academic performance and use of five library services. *College and Research Libraries*, *81*(3), 435–458. https://doi.org/10.5860/crl.81.3.435
Bi, S., Wang, C., Zhang, J., Huang, W., Wu, B., Gong, Y., & Ni, W. (2022). A survey on artificial intelligence aided Internet-of-Things technologies in emerging smart libraries. *Sensors*, *22*(8), 1–20. https://doi.org/10.3390/s22082991
Cox, A. M., Pinfield, S., & Rutter, S. (2019). The intelligent library: Thought leaders' views on the likely impact of artificial intelligence on academic libraries. *Library Hi Tech*, *37*(3), 418–435. https://doi.org/10.1108/LHT-08-2018-0105
Hamad, F., Al-Fadel, M., & Shehata, A. M. K. (2023). The level of digital competencies for the provision of smart information service at academic libraries in Jordan. *Global Knowledge, Memory and Communication*. https://doi.org/10.1108/GKMC-06-2022-0131
Harisanty, D., Anna, N. E. V., Putri, T. E., Firdaus, A. A., & Noor Azizi, N. A. (2023). Is adopting artificial intelligence in libraries urgency or a buzzword? A systematic literature review. *Journal of Information Science*. https://doi.org/10.1177/01655515221141034
Huang, Y. H. (2022). Exploring the implementation of artificial intelligence applications among academic libraries in Taiwan. *Library Hi Tech*. https://doi.org/10.1108/LHT-03-2022-0159
Hussain, A. (2023). Use of artificial intelligence in the library services: prospects and challenges. *Library Hi Tech News*, *40*(2), 15–17. https://doi.org/10.1108/LHTN-11-2022-0125
Lund, B. D., Omame, I., Tijani, S., & Agbaji, D. (2020). Perceptions toward artificial intelligence among academic library employees and alignment with the diffusion of innovations' adopter categories. *College and Research Libraries*, *81*(5), 865–882. https://doi.org/10.5860/crl.81.5.865
Lund, B. D., & Wang, T. (2023). Chatting about ChatGPT: How may AI and GPT impact academia and libraries? *Library Hi Tech News*, *40*(3), 26–29. https://doi.org/10.1108/LHTN-01-2023-0009

Mardiana, Siska; Suminar, Jenny Ratna; Sugiana, D. S. (2019). *University of Nebraska - Lincoln DigitalCommons @ University of Nebraska - Lincoln*. *43*(12), 2–14.

Mathar, T., Hijrana, Haruddin, Akbar, A. K., Irawati, & Satriani. (2021). The Role of UIN Alauddin Makassar Library in Supporting MBKM Program. *Proceedings of the International Conference on Social and Islamic Studies*, 215–224. https://proceedings.uin-alauddin.ac.id/index.php/sis/SIS2021/paper/view/163

Megan Oakleaf. (2010). *Value of Academic Libraries: A Comprehensive Research Review and Report* (Megan Oakleaf (ed.)). American Library Association.

Okunlaya, R. O., Syed Abdullah, N., & Alias, R. A. (2022). Artificial intelligence (AI) library services innovative conceptual framework for the digital transformation of university education. *Library Hi Tech*, *40*(6), 1869–1892. https://doi.org/10.1108/LHT-07-2021-0242

Rahaman, A., Dilip, R., Vidyapeeth, T. B., Prajapat, V., Rupali, D., Taru, D., & Md, D. (2022). A comparative study about expansion of digital libraries in the current era and existence of traditional library. *International Journal of Advances in Engineering and Management (IJAEM)*, *4*(6), 1526. https://doi.org/10.35629/5252-040615261533

Saibakumo, W. T. (2021). Awareness and acceptance of emerging technologies for extended information service delivery in academic libraries in Nigeria. *Library Philosophy and Practice*, *2021*, 1–11.

Soltani, S., & Nikou, S. (2020). An assessment of academic library services: International and domestic students perspectives. *Library Management*, *41*(8–9), 631–653. https://doi.org/10.1108/LM-04-2020-0071

Yoon, J. W., Andrews, J. E., & Ward, H. L. (2022). Perceptions on adopting artificial intelligence and related technologies in libraries: public and academic librarians in North America. *Library Hi Tech*, *40*(6), 1893–1915. https://doi.org/10.1108/LHT-07-2021-0229

Yusuf, T. I., Adebayo, O. A., Bello, L. A., & Kayode, J. O. (2022). Adoption of artificial intelligence for effective library service delivery in academic libraries in Nigeria. *Library Philosophy and Practice*, *January*, 1–13.